

Wireless Mining

By Jeff Goldman

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Rajant Corporation was founded in late 2001 immediately following the events of 9/11, with the aim of providing a solution to the problems experienced by first responders at Ground Zero, when different agencies using different radio systems were unable to communicate with each other. The company's BreadCrumb series of products is designed to create an instant 2.4 GHz Wi-Fi network in any situation.

Key to the solution, according to Glenn Booth, Rajant's vice president of marketing, is the fact that it can be deployed by personnel who don't have any advanced technical knowledge. "The BreadCrumb is a ruggedized network node that has one single switch on it, on or off," he says. "And it quickly turns up, turns on, figures out what other BreadCrumbs are around, and connects to all of them in a mesh."

The result is a mesh network that can support a wide range of devices and applications. "You can use IP devices, you can use PDAs, you can use VoIP phones, you can use IP cameras and laptops, etc., to talk to one another over multiple VPN streams through this cloud in a secure fashion," Booth says.

Multiple applications

The BreadCrumb product line, Booth says, was quickly picked up by the U.S. military for a wide variety of uses. "It could be people on a convoy on humvees going through the desert, and the guy in front has a video camera and a BreadCrumb, the guy in the back has a BreadCrumb, and they're all linked together and everybody can see what's going on," he says. "Or it could be an unmanned aircraft being remote-controlled over the convoy with a camera on it, so the convoy can see what's going on a mile in front."

Following the bombings in the London Underground in 2005, Rajant participated in a trial of an underground network in the subway tunnels. "We found that we had a lot of success underground... what we find in tunnels is that we get a lot of multipath reflection, and we get some pretty non-line-of-sight characteristics around corners and things – it works in our favor," Booth says.

Having heard about the London Underground trial, the U.S. Mine Safety and Health Administration (MSHA) contacted Rajant about a year and a half ago, Booth says, to explore the possibility of using the company's solution in mines – and Rajant is currently undergoing testing with MSHA towards becoming approved for that use nationwide.

West Virginia seal of approval

In the meantime, the BreadCrumb system was approved last month by the West Virginia Office of Miner's Health, Safety and Training (WV OMHS&T), and is now listed on its Web site as fulfilling the state's safety requirements for underground mining.

Rajant's BreadCrumb WE-IS (see image) is designed to be intrinsically safe for use in mines – and Booth says it's able to support any level of security the mine requires. "You can go from, on the low end, nothing—it's just open, and you connect and associate with a BreadCrumb—to basic WEP, to WPA2, and all the way up to SecNet 11," he says.

In a mine cave-in, Booth notes, basic communications infrastructure like leaky feeder can get crushed and broken, resulting in a real need for a mesh network like Rajant's. And even under normal conditions, Booth says leaky feeder's coverage is always going to be limited. "The entrance to the mine isn't covered by it – and then newly excavated mine takes a while before leaky feeder makes its way in there," he says.

Emergency networks

Still, it's in an emergency that the BreadCrumb system's adaptability can be particularly helpful. "You don't really know the new configuration, unfortunately, after an explosion or a cave-in—and that's the challenge," Booth says.

In a situation like that, Booth says, rescuers can simply drill a hole and drop in a BreadCrumb. "It can quickly determine if there are any active BreadCrumbs around, and if so, link up to them and link into everything else," he says. "So it's a new backhaul point for the BreadCrumb wireless network... and if any of the miners have a VoIP phone or any IP-enabled device, they can talk to the outside world."

Booth says the speed with which the network can reconfigure itself is a key differentiator for Rajant. "In milliseconds, the whole network adjusts and stabilizes," he says. "And that's really important in an emergency situation, because you could have a BreadCrumb on a mining car, you could have a BreadCrumb on a rescue vehicle going into the mine itself, or you could have one on an ambulance outside."



A cooperative industry

At the same time, Booth notes that Rajant only supplies one part of the solution—the network—and there are a lot of other pieces of the puzzle, including the tracking of individual miners, for which Booth says Rajant's current BreadCrumb product is too heavy. "There are some other companies that are making, essentially, RFID tags for miners... and we're working with those types of people," he says.

Booth says one of the best things about working in the mining industry is the cooperative attitude shown by most vendors. "The whole emphasis by MSHA and all the local officials is to get everyone to share information and work together," he says. "It's not the same kind of competitive environment that you might find in the enterprise sector or other places. It's a lot different – because there's human life at stake."